

## A New Species of *Salvia* (Lamiaceae) from Chugoku District, Japan, *Salvia akiensis* sp. nov.

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A novel species, *Salvia akiensis* A.Takano, Sera & Kurosaki, from western Honshu, Japan, is described. *Salvia akiensis* occurs in Hiroshima and Shimane prefectures and flowers in May and June. *Salvia akiensis* is similar to *S. isensis*, *S. lutescens sensu lato* and *S. omerocalyx* in having long exerted stamens. However, the species can be distinguished from *S. isensis* by having much larger flowers, and from *S. omerocalyx* by having one pair of cauline leaves, long pilose hairs on the inside upper half of the calyx tube, multicellular hairs 1–2 mm long on the outside of the dorsal calyx lobe, and pale bluish-purple corollas. It can be distinguished from *S. lutescens sensu lato* by its smaller flowering shoots, the leaf apex roundish, flowering shoot with a single pair of cauline leaves and larger calyx and corolla.

Key words: Japan, Lamiaceae, new species, *Salvia*, *Salvia akiensis*, *Salvia lutescens*, *Salvia omerocalyx*

*Salvia* L. (tribe Mentheae), the largest genus in the Lamiaceae, includes nearly 1,000 species. The genus has radiated extensively in warm temperate regions, such as in Central and South America and western and eastern Asia (Alziar, 1988–1993). It is distinguished from other genera in the family by the two aborted posterior stamen thecae of the two expressed stamens.

The 10 species, 8 varieties and 1 putative hybrid of *Salvia* described from Japan (Murata & Yamazaki 1993, Inoue 1997, Hihara *et al.* 2001) are classified into three subgenera, *Allagospadonopsis* Briq., *Salvia*, and *Sclarea* (Moench) Benth. Among the subgenera, Subg. *Allagospadonopsis* is distinguished by free stamens and consists of approximately 20 species in south-eastern to eastern Asia (Murata 1952). Recent molecular phylogenetic analysis of Japanese *Salvia* demonstrated that subg. *Allagospadonopsis* was monophyletic (Takano & Okada 2011).

Sera *et al.* (2009) reported unidentifiable plants of *Salvia* of subg. *Allagospadonopsis* from Hiroshima Prefecture as a putative new taxon. Within subgenus *Allagospadonopsis*, only *S. japonica* Thunb. has been recognized for that region. Sera *et al.* (2009) distinguished the plants from *S. japonica* by their long exerted stamens and earlier flowering period. Additionally, we noticed that specimens of *Salvia* from Shimane Pref. and sent to HYO for identification were the same as the plants reported by Sera *et al.* (2009). After a detailed examination and comparison with other species of Subgen. *Allagospadonopsis* in Japan, China, Korea and Taiwan, we concluded that these plants represented undescribed species.

***Salvia akiensis* A. Takano, Sera & Kurosaki, sp. nov.** — Fig.1

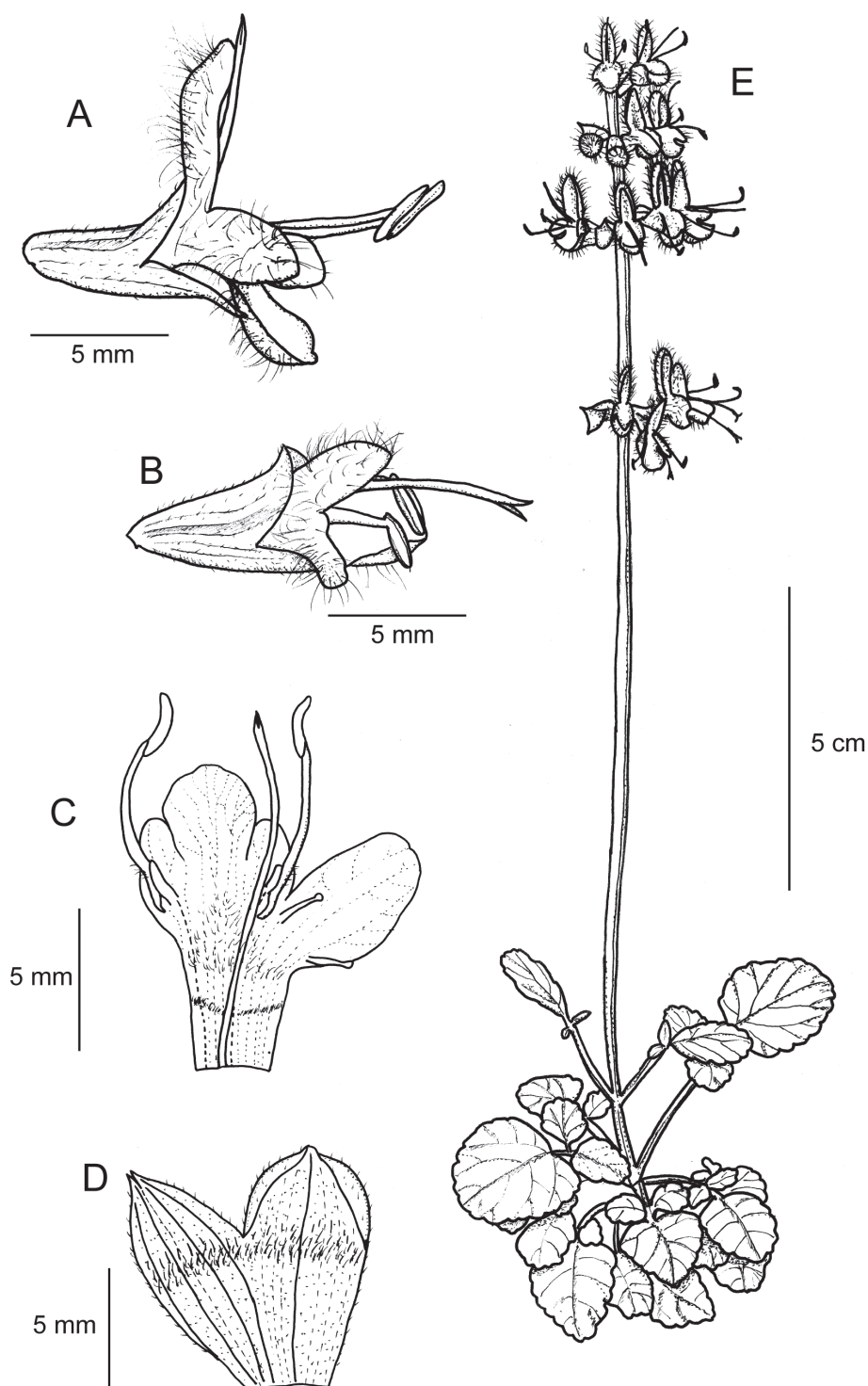


FIG. 1. *Salvia akiensis* A.Takano, Sera & Kurosaki. A: Hermaphrodite flower [drawn from A.Takano & N.Kurosaki with T. Sera 130606-1 (HYO C1-244424)]. B: Male-sterile flower [drawn from A.Takano & N. Kurosaki with T. Sera 130606-33b (HYO C1-244494)]. C: Inside of hermaphrodite corolla with stamens and pistil, cut and spread out. D: Inside of calyx, cut and spread out. E: Habit.

Resembles *Salvia lutescens* (Koidz.) Koidz. *sensu lato*, but differs by having only one pair of cauline leaves, roundish leaflets, longer calyx in flower (6–7 mm vs. 3–4 mm) and longer corolla (10–12 mm vs. 8–10 mm), and earlier flowering season. Also superficially similar to *S. omerocalyx* Hayata, but differs by bearing one pair of cauline leaves, long pilose only on the upper half of the inside of the calyx tube, and pale bluish purple corollas.

*Typus.* JAPAN, Honshu: Hiroshima Prefecture, Akiota-cho, Inoshiyama, 430 m alt., 06 June 2013, A. Takano & N. Kurosaki with T. Sera 130606-1 [Holo- HYO (C1-244424), Iso- HIBG (= Hiroshima Botanical Garden; details submitted to Index Herbariorum), KYO, SNMS, TI, TNS].

Herbs, perennial, erect. Rhizome short creeping. Stems simple, erect, quadrangular, pubescent and mixed pilose, 20–45 cm tall. Leaves opposite, mostly radical; radical leaves tufted; petiole of radical leaves 3.5–9.5 cm long, pubescent and mixed pilose; cauline leaves 1 pair, ternate or sometimes simple or pinnate. Blade of radical leaves ovate to elliptic 6–12.5 cm long, 1.5–3.5 cm wide, upper surface dark green, shiny, dotted with glands throughout, sparsely hairy; lower surface pale green, pubescent or glabrous, dotted with glands throughout; lateral leaflets short petiolulate, narrowly elliptic to ovate, 5–18 mm long, 2–15 mm wide, margin often with a few shallow teeth; terminal leaflet largest, elliptic to ovate, often asymmetric, 1.5–5.5 cm long, 0.6–4 cm wide, base truncate or shallowly cordate, margin crenate or undulate, apex rotund; petiolule 5–25 mm long. Culine leaves 1 pair, smaller than radical leaves, at middle of stem, ternate or simple, sometimes bract-like or wanting. Flowers May to June. Raceme terminal, simple or sometimes branched at base, 2.5–12 cm long, rachis puberulent and mixed pilose; verticillasters 2–8 flowered, lower verticillasters widely spaced, upper ones crowded. Bracts and bracteoles lanceolate, 2–10 mm long, 0.5–3 mm wide, margin entire, minutely pubescent. Pedicel 1–2 mm long, densely puberulent. Calyx tubular, bilabiate, 6–7 mm long, sparsely hairy, throat long pilose inside; upper lip rotund, c. 1.5 mm

TABLE 1. Comparison of morphological characters in *Salvia akiensis*, *S. isensis*, *S. lutescens sensu lato* and *S. omerocalyx*.

Species	height (cm)	No. of cauline leaves	form of radical leaves	shape of leaflets	base of leaflets	apex of leaflets	flowering period	calyx length in flower (mm)	hairs on outside of calyx	hairs on inside of calyx tube	color of corolla	corolla length (mm)	hairs on corolla lobe	hairs at the base of connective
<i>S. akiensis</i>	20–45	one pair	mainly ternate, sometimes pinnate or simple	elliptic to ovate	truncate or shallowly cordate	rotund	May to June	6–7	sparsely pubescent	long pilose on upper half	pale bluish purple	10–12	multicellular, 1–2 mm long	pilose or sometimes wanting
<i>S. isensis</i>	10–60	one or two pairs	odd pinnate	orbiculate, ovate to lanceolate	uncate	acute or obtuse	July to Nov.	ca. 3	sparsely pubescent on nerves, mix glandular pilose	pubescent on throat	pale bluish purple	7–8	unicellular or sometimes multicellular, 0.5–1(-2) mm long	wanting, or sometimes pilose
<i>S. lutescens sensu lato</i>	40–70	several pairs	mainly pinnate, sometimes ternate or simple	widely ovate, oblong-ovate or lanceolate	truncate or shallowly cordate	acute	June to August	3–4	pubescent, sometimes glandular pilose	long pilose on upper half	pale yellow, violet, pale blue	8–10	unicellular or sometimes multicellular, 0.5–1(-2) mm long	wanting (var. crenata) or sometimes pilose (others)
<i>S. omerocalyx</i>	10–45	0	mainly ternate, sometimes pinnate or simple	ovate to broadly ovate	uncate or rounded	obtuse or subacute	May to June	5–6	pubescent and mixed glandular pilose	puberulent throughout	deep violet	10–12	glandular, < 1 mm long	wanting



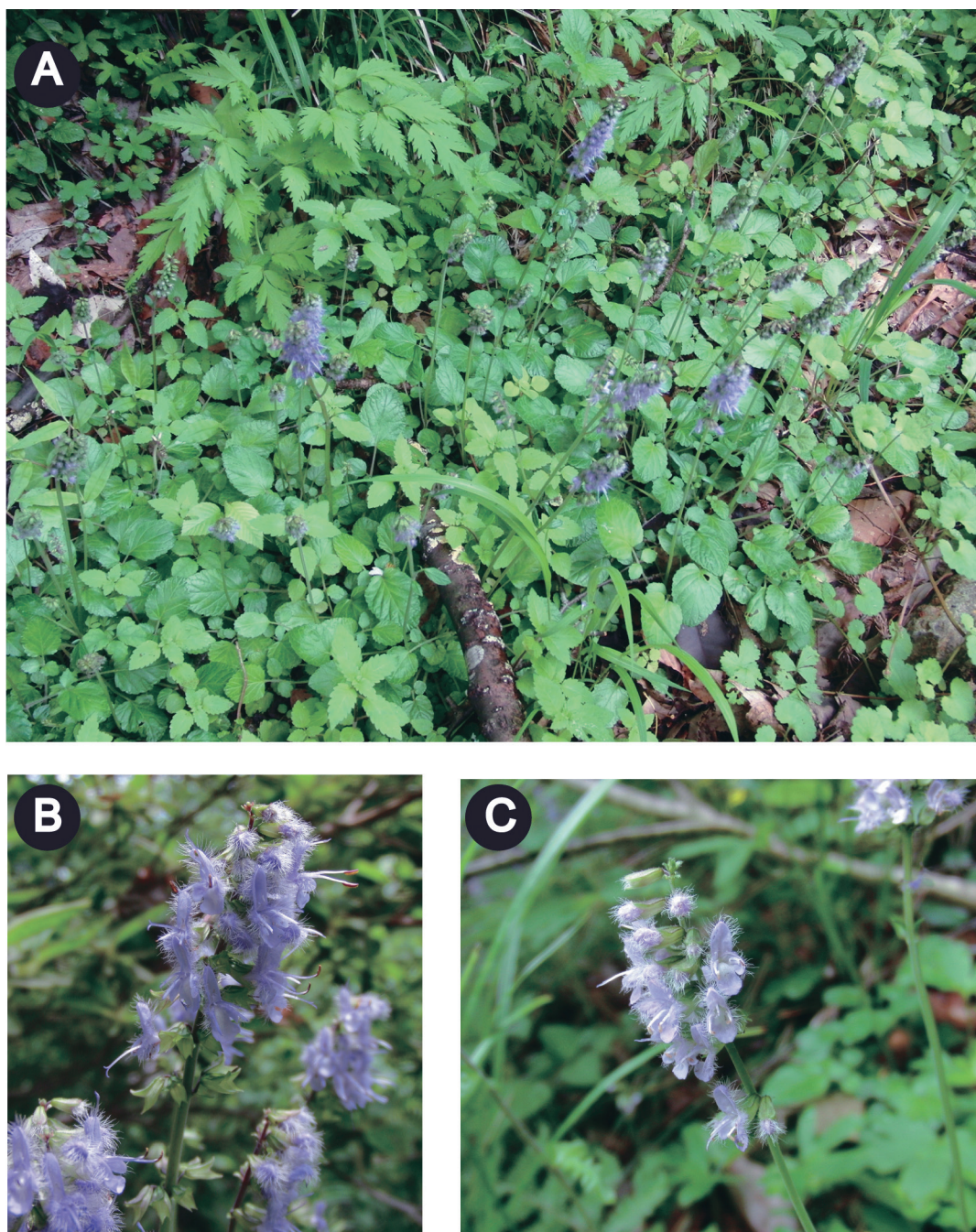


FIG. 2. Habitat and floral dimorphism of *Salvia akiensis*. A: Habitat. B: Inflorescence of hermaphrodite flowers [*A. Takano & N. Kurosaki with T. Sera 130606-1* (HYO C1-244424)]. C: Inflorescence of male-sterile flowers [*A. Takano & N. Kurosaki with T. Sera 130606-33b* (HYO C1-244494)].

long, c. 2 mm wide; lower lip bilobed, lobes triangular-lanceolate, apiculate-acuminate. Corolla tubular, bilabiate, pale bluish purple or rarely white, 6–12 mm long, with multicellular hairs 1–2 mm long on outside; tube 5–6 mm long, with a ring of hairs near middle inside, lips broadly opening; upper lip 3–5 mm long, convex; lower lip 4–5 mm long, 3-lobed, middle lobe largest, widely orbiculate, emarginate. Stamens long exerted in hermaphrodite flowers, slightly or not exerted in male-sterile flowers, filaments ca. 2.5 mm long, half-anthers linear, connective 2–8 mm long, straight or slightly curved, long pilose at base or sometimes glabrous. Nutlets narrowly ellipsoid, ca. 1.8 mm long, ca. 1 mm wide, glabrous, brown.

*Chromosome number.*  $2n = 16$  (Sera *et al.* 2009)

*Japanese name.* Teriha-natsuno-tamurasou (Sera *et al.* 2010)

*Etymology.* The epithet *akiensis* is derived from the former provincial name ‘Aki’ for the western part of Hiroshima Prefecture where *Salvia akiensis* was discovered.

*Other Specimens examined:* JAPAN, Honshu: Hiroshima Pref., Akiota-cho, Togouchi, Shimoyama, *T. Sera et al.* hbg-15409, -15921, -15924, *T. Sera* hbg-21207, -21208, -21209, -21212 (HIBG); *ibidem*, *T. Sera* s.n. (HYO); Kitahirosima-cho, Hashiyama, *T. Sera* hbg-21210, -21211 (HIBG); *ibidem*, *A. Takano & N. Kurosaki* with *T. Sera* 130606-30, -33a, -33b [HYO(C1-244425, C1-244493, C1-244494), KYO]. —Shimane Pref., Gotsu-shi, Ushiroji-cho, Matsui, *M. Noriyuki* s.n. (HYO); *ibidem*, *M. Sakoda, K. Sato & M. Noriyuki-1*. (KYO, HYO); Gotsu-shi, Ushiroji-cho, *M. Sakoda, K. Sato & M. Noriyuki-2* (KYO, HYO); Gotsu-shi, Matsukawa-cho, Yakami, 40 m alt., *M. Sakoda* 9150 (HYO); *ibidem*, *M. Sakoda, K. Sato & M. Noriyuki-3* (KYO, HYO).

Table 1 shows morphological characteristics of *Salvia akiensis*, *S. isensis* Nakai, *S. lutescens sensu lato*, and *S. omerocalyx* Hayata. Compared with *S. isensis*, *Salvia akiensis* has a larger calyx (6–7 mm long vs. 3–6 mm long) and larger co-

rolla (10–12 mm long vs. 7–8 mm long). The relationship between *S. akiensis* and *S. lutescens sensu lato* is complex, since the latter varies widely in morphology. Most characteristics of *S. akiensis* are also found in *S. lutescens*. *S. lutescens* var. *crenata* appears superficially most similar to *S. akiensis* by having widely ovate or orbicular-ovate terminal leaflets with an obtuse or round apex and pale blue flowers. However, both the calyx and corolla of *S. lutescens sensu lato* are smaller than in *S. akiensis*; *S. lutescens* typically has unicellular hairs on the corolla lobes, 1- or 2-pinnate leaves, more than one pair of cauline leaves, leaflets with an acute apex, and flowers from June to August (Murata & Yamazaki 1993).

*Salvia akiensis* also resembles *S. omerocalyx* in having rather round, ternate radical leaves and flowering in May and June, but they are clearly distinguished by the presence of cauline leaves (1 pair vs. cauline leaves absent, Fig.1E), hairs on the inside of the calyx tube (long pilose on upper half vs. puberulent throughout), hairs on the corolla lobe (multicellular hairs vs. glandular), and flower color (pale bluish purple vs. deep violet).

*Salvia akiensis* grows in moist, shallow soil on rock walls by streams in deciduous forests with *Carex conica* Boot and *Osmunda lancea* Thunb. in Hiroshima Prefecture. In Shimane it grows among bamboo by roadsides and on slopes below evergreen mixed forests and plantations (M. Sakoda, pers. comm.). Sakoda *et al.* (2014) described habitat preferences of the new species in Shimane Prefecture in detail.

*Salvia akiensis* has male-sterile and perfect flowers on different individuals (Fig.1.A & B; Fig. 2. B & C) as in *S. omerocalyx* (Takano 2013). Male-sterile flowers have a smaller corolla and shorter anther connectives than in perfect flowers, and little or no pollen was observed in their anther sacs. Male-sterile individuals occur in both Hiroshima and Shimane prefectures, but further studies are required to understand the sex expression.

Key to Japanese species of subgenus *Allagospadonopsis*, *Salvia* L.  
(modified from Murata & Yamazaki 1993)

- 1a. Corolla 2–3 cm long; stamens connected by callous tips of lower connectives ..... (Subgenus *Salvia*)
- 1b. Corolla 0.4–1.2 cm long; stamens free or connected by callous tips of lower connectives..... 2
- 2a. Annual or biennial herbs; stamens connected by callous tips of lower connectives ..... (Subgenus *Sclarea*)
- 2b. Perennial herbs; stamens free (Subgenus *Allagospadonopsis*) ..... 3
- 3a. Leaves generally radical and cauline ..... 4
- 3b. Leaves all radical ..... 8
- 4a. Stamens and style slightly longer than upper corolla lip ..... 5
- 4b. Stamens and style much longer than upper corolla lip ..... 6
- 5a. Corolla tube with ring of hairs near base inside, flowers July to November, stems 20–80 cm tall ..... *S. japonica*
- 5b. Corolla tube with ring of hairs near middle inside, flowers April to June, stems 10–20 cm tall ..... *S. ranzaniana*
- 6a. Calyx tube pubescent in throat; corolla 7–8 mm long ..... *S. isensis*
- 6b. Calyx tube long pilose on upper half; corolla 8 mm long or more ..... 7
- 7a. Corolla 8–10 mm long; flowering calyx 3–4 mm long; flowers July to November ..... *S. lutescens*
- 7b. Corolla 10–12 mm long; flowering calyx 6–7 mm long; flowers May and June ..... *S. akiensis*
- 8a. Leaves generally pinnate; flowering calyx 2 mm long, 4 mm long in fruit; corolla ca. 5 mm long, white ... *S. pygmaea*
- 8b. Leaves generally ternate; flowering calyx 5–6 mm long, 7–8.5 mm long in fruit; corolla 10–12 mm long, bluish purple ..... *S. omerocalyx*

We thank Mr. Shigeo Takasugi, who discovered *S. akiensis* and gave us the opportunity to study it, Mrs. Masahiro Sakoda, Katsunori Sato, Masaomi Noriyuki for providing information and materials of *S. akiensis* from Shimane Prefecture. Dr. Hiroshi Okada and two anonymous reviewers gave us critical comments on an earlier version of the manuscript. This study was supported in part by a Grant-in-Aid for Scientific Research (B) (No. 24300311 to T. Sakiyama) from the Japanese Ministry of Education, Culture, Sports, Science and Technology.

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Received July 11, 2013; accepted November 27, 2013